

What is claimed is:

1. A method of etching a semiconductor device using a neutral beam comprising:
- 5 extracting an ion beam having a predetermined polarity from an ion source to accelerate the ion beam;
- reflecting an accelerated ion beam by a reflector to neutralize the reflected ion beam; and
- 10 positioning a substrate to be etched in the path of a neutral beam to etch a special material layer on the substrate with the neutral beam.
2. The method of claim 1, wherein the step of neutralizing the ion beams is performed after adjusting the angle of incidence of the ion beam incident on the reflector.
- 15 3. The method of claim 2, wherein the angle of incidence of the ion beam incident on the reflector is within the range of 75 - 85° from the vertical line to the horizontal surface of the reflector.
- 20 4. The method of claim 3, wherein the step of neutralizing the ion beam is performed after adjusting the gradient of the reflector to an incident ion beam.
5. The method of claim 3, wherein the step of neutralizing the ion beam is performed after applying a voltage to the reflector to adjust the path of an incident ion beam.
- 25 6. The method of claim 1, wherein the reflector is one of a semiconductor substrate, a silicon dioxide substrate and a metal substrate.
7. An apparatus for etching a semiconductor device using a neutral beam, the apparatus comprising:
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an ion source for extracting and accelerating an ion beam having a predetermined polarity;

a reflector positioned in the path of the ion beam accelerated from the ion source for reflecting and neutralizing the ion beam; and

5 a stage for positioning a substrate to be etched in the path of the neutral beam.

10 8. The apparatus of claim 7, wherein the ion source is an inductively coupled plasma source, and a grid is formed to accelerate the ion beam at the rear of the ion source.

15 9. The apparatus of claim 7, wherein the reflector is formed of a plurality of plates which are spaced apart from each other to reflect the ion beam.

20 10. The apparatus of claim 7, wherein the reflector is formed of a plate which may be tilted to adjust the angle of incidence of an incident ion beam to the horizontal surface of the plate.

25 11. The apparatus of claim 7, wherein the reflector is formed of a plurality of cylindrical reflectors, which are overlapped, of which adjacent reflectors have different polarities.

12. The apparatus of claim 7, wherein the position of the stage is adjusted to the path of the neutral beams reflected by the reflector.

13. The apparatus of claim 7, wherein the reflector is one of a semiconductor substrate, a silicon dioxide substrate, and a metal substrate.

14. The apparatus of claim 7, further comprising an ion beam blocker having a slit passing only ions within a predetermined range between the ion source and the reflector.

5 15. The apparatus of claim 7, further comprising a retarding grid between the reflector and the stage.

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